

The background of the slide is a light gray gradient. It is decorated with numerous realistic water droplets of various sizes. Some droplets are in the top left corner, some are in the bottom right, and others are scattered in the center. Each droplet has a highlight and a shadow, giving it a three-dimensional appearance.

PHYSICS APPLICATIONS IN MATLAB

AS OF MARCH 2, 2017

INJECTOR PHYSICAL PARAMETERS CONTROL

Figure 4

File Edit View Insert Tools Desktop Window Help

CeC Injector Physics Controls

Source Controls On/...

Gun Kinetic Energy, MeV	1.5000
Relativistic factor	3.9354
Beam rigidity, kGs cm	6.4833

LEBT Controls On/Off

LEBT Kinetic Energy, MeV	1
Relativistic factor	2.9569
Beam rigidity, kGs cm	4.7399

	Larmor Angle, degrees	Calculated Current, A	Current Readback, A	Focal length, m
Gun Solenoid	0	0	-0.0040	Inf

	Larmor Angle, degrees	Calculated Current, A	Current Readback, A	Focal length, m
Solenoid 1	0	0	-0.0018	Inf
Solenoid 2	0	0	-0.0014	Inf
Solenoid 3	0	0	-0.0032	Inf
Solenoid 4	0	0	-0.0017	Inf
Solenoid 5	0	0	-0.0014	Inf

	Deflection Angle, mrad	Calculated Current, A	Current Readback, A
cs2-gun.tv1-ps	0	0	-7.0000e...
cs2-gun.th1-ps	0	0	-2.4000e...

	Deflection Angle, mrad	Calculated Current, A	Current Readback, A
cs2-inj.th1-ps	0	0	-8.3000e...
cs2-inj.tv1-ps	0	0	-8.4000e...
cs2-inj.th2-ps	0	0	0.0011
cs2-inj.tv2-ps	0	0	-1.0000e...

INJECTOR PHYSICAL PARAMETERS CONTROL

- The solenoids are set in Larmor angle (plane rotation) and correctors in deflection angle
- Application changes actual settings in the control system including energy (values are saved)
- Operator can turn On/Off control independently for the gun and LEBT section
- If controls are Off the angles are calculated from currents, if they are On the currents are calculated from angles and applied to the system

HIGH ENERGY BEAM PHYSICAL PARAMETERS CONTROL

Figure 5

File Edit View Insert Tools Desktop Window Help

CeC Beamline Physics Controls

On/Off

Beam Kinetic Energy, MeV 21.9500

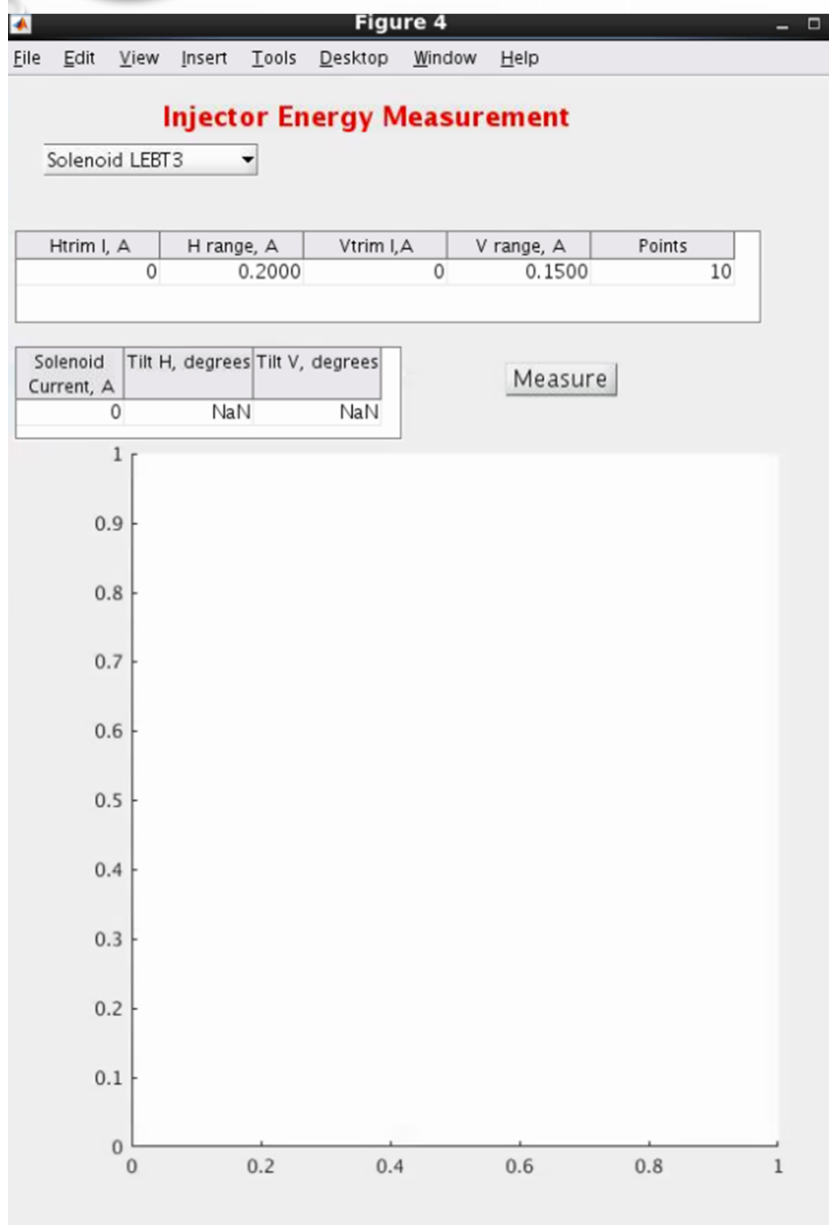
Relativistic factor 43.9550

Beam rigidity, kGs cm 74.8506

Element	K1, m ⁻²	Calculated Current, A	Current Readback, A	Focal length, m
Triplet Quad 1	0	0	-0.0016	-Inf
Triplet Quad 2	0	0	-3.2000e-04	-Inf
Triplet Quad 3	0	0	-0.0057	-Inf
Dogleg Quad 1	0	0	-7.0000e-05	-Inf
Dogleg Quad 2	0	0	1.4000e-04	-Inf
Dogleg Quad 3	0	0	-0.0033	-Inf
Modulator Quad 1	0	0	-0.0057	-Inf
Modulator Quad 2	0	0	-0.0014	-Inf
Modulator Quad 3	0	0	-0.0018	-Inf
Modulator Quad 4	0	0	-0.0169	-Inf
Kicker Quad 1	0	0	-1.4000e-04	-Inf
Kicker Quad 2	0	0	-2.8000e-04	-Inf
Kicker Quad 3	0	0	-0.0025	-Inf
Kicker Quad 4	0	0	-0.0016	-Inf
Dump Quad 1	0	0	-0.0012	-Inf
Dump Quad 2	0	0	-0.0025	-Inf

Element	Angle, mrad	Calculated Current, A	Current Readback, A
Triplet Vert Trim 1	0	0	4.0000e-04
Triplet Hor Trim 2	0	0	4.0000e-05
Triplet Vert Trim 3	0	0	1.1000e-04
Dogleg Vert Trim 1	0	0	-3.0000e-05
Dogleg Hor Trim 2	0	0	3.0000e-05
Dogleg Vert Trim 3	0	0	-3.0000e-05
Modulator Vert Trim 1	0	0	2.2000e-04
Modulator Hor Trim 2	0	0	9.0000e-05
Modulator Vert Trim 3	0	0	-2.6000e-04
Modulator Hor Trim 4	0	0	0
Kicker Hor Trim 1	0	0	1.8000e-04
Kicker Vert Trim 2	0	0	3.5000e-04
Kicker Hor Trim 3	0	0	3.5000e-04
Kicker Vert Trim 4	0	0	0.0156
Dump Vert Trim 1	0	0	1.6000e-04
Dump Hor Trim 2	0	0	2.7000e-04

INJECTOR ENERGY MEASUREMENT



- Operator can select one of the two sets
- Then script changes consecutively horizontal and vertical trims and monitors orbit with BPM
- The points are plotted in the XY coordinates and tilt angle is calculated
- Trim and solenoid set-points are not editable (range only)
- Operator should change solenoid, adjust trims independently and hit “Measure” button

CAMERA TEST

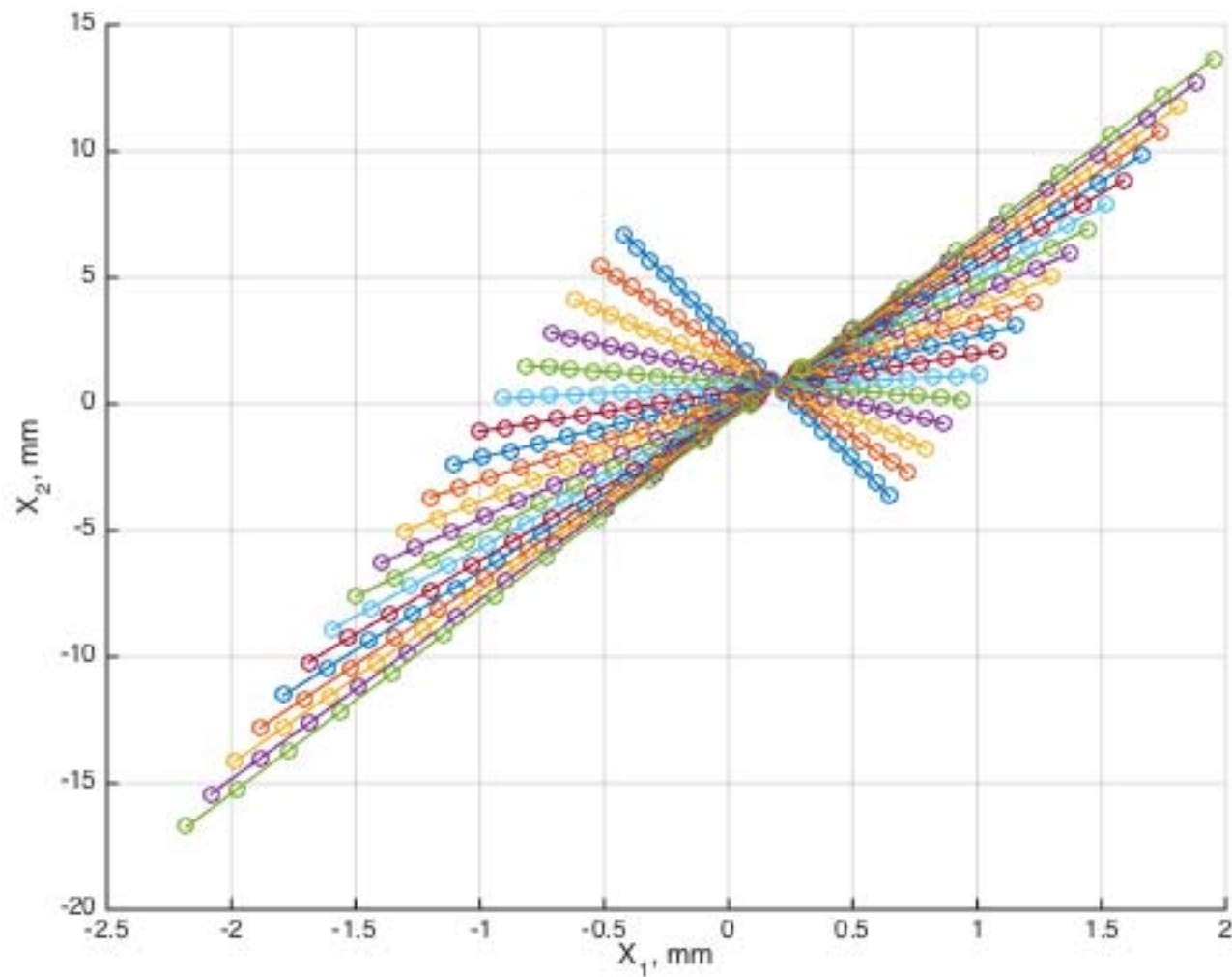


Just for test of communication with camera. Allows set exposure, trigger, gain, data format, and get image.

QUADRUPOLE CENTERING (DEVELOPMENT)

- Beam position in the quadrupole is changed with a trim
- Quadrupole strength is varied and beam position near quadrupole BPM (X_1) and far from quadrupole (X_2) are plotted
- The sets of straight lines are to intersect where beam position is not affected by quadrupole
- Due to the measurement errors the lines will not intersect in one point. The data will be processed in the following manner:
 - we need to find X_1^* and X_2^* satisfying set of linear equations $X_2^* = a_i \times X_1^* + b_i$, or $b_i = a_i \times X_1^* - X_2^*$, i.e. we need to find best linear fit for (a_i, b_i)

QUADRUPOLE CENTERING (DEVELOPMENT)





To operate script one need to start MATLAB (type `matlab` in the terminal window).

Script were partially tested but need some debugging with beam.

Time to time we have data server timeouts (especially with start of the script) – watch MATLAB error messages.

The scripts are on my desktop of Linux account (I've sent them to some people).

We will have a special directory for depositary of readied scripts.

